REMARKS

Reconsideration of this application is requested. Claims 18, 20, 23, 31, 33, 41 and 45 to 49 are pending. The pending independent claims are 18 and 49. The amendment to claim 18 was suggested in the Action to overcome the drawing objection and section 112 rejection.

This Amendment after final should be entered because it amends claim 18 in a manner that clearly overcomes the objection and 112 rejection and moves this application towards allowance. This amendment should also be entered because it amends claims 45 and 49 to make clear that a rectangular wave is "periodic" which clearly distinguishes the ON/OFF power transition of Yasui.

The objection to the drawings and section 112 rejection have been overcome by amending claim 18 in the manner suggested in the Action.

<u>The rejection of independent claim 49 as being anticipated by Yasui et al (U.S. Patent No. 5,248,963 – Yasui) is traversed.</u>

Claim 49 recites signals formed of "rectangular wave signals" being applied by the LCD erasing circuit. A "wave" signal is by definition "periodic". *See* attached definition of "rectangular wave" from the McGraw-Hill Dictionary of Scientific and Technical Terms (5th Ed.) page 1666. To make more clear that a rectangular wave is periodic, claims 45 and 49 have been amended to expressly require a "rectangular periodic wave." These claims further require that the that the erasing circuit "applies rectangular wave

signals, identical in terms of phase and potential, respectively into said pixel electrode and said opposing electrode during the certain period" which follows the power source being turned off.

<u>Yasui does not disclose rectangular periodic waves</u>, that are identical in terms of phase and potential, respectively into said pixel electrode and the opposing electrode. Yasui discloses reducing the source bus driver signal to a constant common potentials (E_2) to clear the pixels of a display. These potentials are applied to turn OFF the pixels. The transition is a single step DC voltage change. The transition is not periodic and does not form a rectangular wave.

In particular, Yasui discloses in column 6, lines 3 to 6 that a common potential is supplied to a display electrode 12a and an opposing electrode 12b (a DC voltage E_2 is supplied to <u>the opposing voltage 12b</u>) within a time (T) after the power is turned OFF. During the period T, the voltage E_2 discharges to ground. Yasui (column 5, lines 4-6) states that "[t]he supply of these voltages V_1, V_2, V_3, E_1, E_2 and E_3 is stopped when the power supply of the display device main body is turned OFF." Yasui teaches that a ground potential EG is supplied to both the display electrode 12a and the counter electrode 12b within the time T after the power is turned OFF. Yasui (column 5, line 6, to column 6, line 1) describes that "[t]he source bus driver 16b is arranged so that the potential as its output terminal goes to the common potential EG at substantially the same time as the operating voltages E_1, E_2 and E_3 drop to the common potential". There is no

teaching of periodically applying EG and E_2 voltages in a rectangular wave fashion to the source bus for the pixels.

<u>The rejection of claims 18, 20, 23, 31, 33, 41 and 45 to 48 as being obvious over Yasui in view of Tsuboyama et al (US Patent 5,592,191 – Tsuboyama) is traversed.</u>

Independent claim 18 (and dependent claims 20, 23 and 45) recites several elements that are not disclosed or suggested by Yasui and Tsuboyama including:

- Claim 18 recites a "source driver", a "source driver control circuit", and a "power source control circuit" for the source driver. Support for these elements of claim 18 can be found at, for example, Figure 1 that shows a power source control section (9), a driver controller (4) and a source driver (6). These circuit elements are not disclosed in Yasui in the manner recited in claim 18. The gate driver power circuit shown in Figure 5 of Yasui is not a power source to the source driver.
- Applying an OFF voltage as a video signal during the "certain period" to erase the pixels of the LCD, as is recited in claim 18. Yasui teaches away by disclosing turning OFF the gate driver to he pixels..
- The power source control circuit causes the source driver control circuit to apply an OFF voltage to the pixel electrodes.
- The source driver control circuit does cause the OFF voltages to be applied to the pixel electrodes.

Yasui discloses a method to erase a liquid crystal display in which the source bus and gate bus driving circuits connected to the source and gate of thin-film-transistors (TFT 13) maintain the TFTs at an active level for a predetermined period after turning OFF the power source. Keeping all pixels active after the power is turned off discharges accumulated charges in the pixel capacitance in a short period. Yasui, col. 6, lns. 33-42. Yasui teaches that after the power supply is turned OFF, each pair of display and counter pixel electrodes are grounded, i.e., discharged to a common potential, within a time period (T) by discharging both electrodes. *See* Yasui col. 6, lns. 3-9.

Yasui discloses supplying a common potential to both a display electrode 12a and a counter electrode 12b within a time (T) after the power is turned OFF (see column 6, lines 3 to 6). Yasui discloses that pixel data (D) is set to a logic "0" to clear the display. Yasui, col. 3, lns. 59-61. The logic "0" pixel data is loaded into a shift register and then applied to the pixels.

Tsuboyama does not relate to active element displays, such as are recited in the claims of this application. Tsuboyama primarily discloses a ferroelectric liquid crystal display having a memory function, in which a non-zero voltage is applied to erase the contents of the picture elements of the display. Tsuboyama, col. 1, lns. 9-12 ("The present invention relates to . . . display devices having a memory effect, such as ferroelectric liquid crystal panels."). The "memory effect" described in Tsuboyama relates to irregular orientation of the liquid crystals in ferroelectric LCD display that are caused by a DC voltage applied to the display. Tsuboyama, col. 1, lns. 33-51. The

irregular orientation of liquid crystals that is the subject of Tsuboyama is unrelated to the problem of residually charged pixels in an active matrix display, that is the subject of the present invention.

The display state in Tsuboyama's display is maintained after the erasing voltage has been applied is because Tsuboyama's display device is a ferroelectric liquid crystal display having a memory property. Fig. 5(A) of Tsuboyama shows the voltage (potential difference) to be applied after the TE period is 0. No switching occurs during a bistable state after the TE period so that the display state is maintained.

With respect to Tsuboyama, the Action asserts that the data side Vc control signal in Figure 5A is equivalent to the source enable signal recited in claim 18 that is at a selecting level during the erase period TE. The data side Vc control signal of Tsuboyama in Figure 5A is a control signal which controls <u>Vc</u> application to the data lines. The data side Vc control signal in Figure 5A is <u>at selecting level</u> during a period in which Vc is being applied to the data lines, that is, <u>non-erase periods TVc1 and TVc2</u>. The data side Vc control signal in Tsuboyama Figure 5A is at selecting level during the erase period Te. Figure 5A shows that the data side Vc control signal is HIGH only during the periods TVc1 and TVc2 and LOW during the erase period TE.

<u>In contrast to Tsuboyama, claim 18 uses a source enable signal which is at a selecting level during a certain period in which the liquid crystal is turned off</u>. This source enable signal is neither disclosed nor suggested by Tsuboyama. The Action does not address this argument that Tsuboyama lacks a teaching of a source enable signal that

is at a selecting level during an erase period. The lack of such teaching in Tsuboyama is by itself sufficient to establish the allowability of claim 18.

These problems and solutions are associated with the pixel switching elements of active matrix displays, and are foreign to ferroelectric liquid crystal displays, as is disclosed in disclosed in Tsuboyama, that have no corresponding switching element. With Tsuboyama's ferroelectric liquid crystal, once the voltage is applied to the liquid crystal for shifting to a stable state, this display state is maintained. A reset pulse (erasing voltage) is applied to erase the display, and without a distinction as to whether the ON-level signal or the OFF-level signal is applied, a voltage (erasing voltage) is returned to the initial state, and the state is maintained because of a memory property of the liquid crystal. Accordingly, Tsuboyama does not disclose that the response speed can be increased, which is one of the features of the present invention.

Tsuboyama discloses a simple matrix, liquid crystal display in which scanned data lines apply voltages of different polarity to change the alignment of liquid crystals in a pixel of a display. Tsuboyama, col. 1, lns. 14-31. To clear a display, Tsuboyama teaches that the following five steps are to occur sequentially in a simple matrix, liquid crystal display having a ferroelectric liquid crystal layer:

(1) A logic circuit 107 receives a detection signal indicating that the power supply has been turned OFF or otherwise interrupted (Tsuboyama, col. 3, lns. 26-29; col. 4, lns. 42-43).

(2) A voltage V_C is applied to all scan and data lines in the display (indicated as TV_{C1} in Figs. 5A and 5C of Tsuboyama). Tsuboyama, col. 4, lns. 38-43.

(3) A negative voltage (V_4) is next supplied to all scan and data lines in the display (indicated as TE in Figs. 5A and 5C of Tsuboyama). Tsuboyama, col. 4, lns. 43-52.

(4) A voltage V_C is next applied to all scan and data lines (indicated as TV_{C2} in Figs. 5A and 5C of Tsuboyama). Tsuboyama, col. 4, lns. 52-55.

(5) Finally, all of the scan and data lines are grounded. Tsuboyama, col. 4, lns. 55-60.

According to Tsuboyama et al. (as shown in Figs. 5A to 5C) in steps (2), (4) and (5) the same voltage is applied to both scan and data lines, such that there is no polarity difference applied to activate the pixels.

Because Tsuboyama does not disclose an active matrix having pixel transistors or other pixel switching elements, it is improper to view Tsuboyama as switching pixels ON and OFF as is done in the present invention. What Tsuboyama et al do teach is that a voltage difference (negative V_4 and zero voltage V_c) is applied across a ferroelectric display to erase the display. This voltage difference changes the orientation of liquid crystals in the display. Accordingly, there are no pixels that are turned ON and OFF in the display disclosed in Tsuboyama.

All claims are in good condition for allowance. If any small matter remains outstanding, the Examiner is requested to telephone the undersigned. Prompt reconsideration and allowance of this application is requested.

Respectfully submitted,

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McGraw-Hill Dictionary of Scientific and Technical Terms

Fifth Edition

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Editor in Chief

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Montreal New Delhi San Juan Singapore Sydney Tokyo Toronto

attenuation of a low-level radio-frequency signal transmitted through the tube is decreased to a specified value. **3.** The time required for a fired ATR (anti-transmit-receive) tube to deionize to such a level that the normalized conductance and susceptance of the tube in its mount are within specified ranges. **4.** The interval required, after a sudden decrease in input signal amplitude to a system or component, to attain a specified percentage (usually 63%) of the ultimate change in amplification or attenuation due to this decrease. **5.** The time required for a radar receiver to recover to half sensitivity after the end of the transmitted pulse, so it can receive a return echo. [NUCLEO] The minimum time from the start of a counted pulse to the instant a succeeding pulse can attain a specific percentage of the maximum value of the counted pulse in a Geiger counter. { ri'kəv·ə·rē ,tīm }

recovery vehicle [MECH ENG] A special-purpose vehicle equipped with winch, hoist, or boom for recovery of vehicles. { ri'kəv·ə·rē ,vē·ə·kəl }

recruitment [PHYSIO] A serial discharge from neurons innervating groups of muscle fibers. { ri'krüt·mənt }

recrystallization [CHEM] Repeated crystallization of a material from fresh solvent to obtain an increasingly pure product. [CRYSTAL] A change in the structure of a crystal without a chemical alteration. [MET] A process which takes place in metals and alloys following distortion and fragmentation of constituent crystals by severe mechanical deformation, in which some fragments grow at the expense of others, so that larger, strain-free grains are formed; it progresses slowly at room temperature, but is greatly speeded by annealing. [PETR] The formation of new mineral grains in crystalline form in a rock under the influence of metamorphic processes. { rē,krist·əl·ə'zā·shən }

recrystallization annealing [MET] Producing a new grain structure without phase change by annealing cold-worked metal. { rē,krist·əl·ə'zā·shən ə,nēl·iŋ }

recrystallization breccia *See* pseudobreccia. { rē,krist·əl·ə'zā·shən ,brech·ə }

recrystallization flow [GEOL] Flow in which there is molecular rearrangement by solution and redeposition, solid diffusion, or local melting. { rē,krist·əl·ə'zā·shən ,flō }

recrystallization temperature [MET] The minimum temperature at which complete recrystallization occurs in an annealed cold-worked metal within a specified time. { rē,krist·əl·ə'zā·shən ,tem·prə·chər }

rectangle [MATH] A plane quadrilateral having four interior right angles and opposite sides of equal length. { 'rek,taŋ·gəl }

rectangular cartesian coordinate system *See* cartesian coordinate system. { rek'taŋ·gyə·lər kär¦tē·zhən kō'ȯrd·ən·ət ,sis·təm }

rectangular cavity [ELECTROMAG] A resonant cavity having the shape of a rectangular parallelepiped. { rek'taŋ·gyə·lər 'kav·əd·ē }

rectangular chart [MAP] **1.** A chart in a rectangular shape. **2.** A chart on the rectangular map projection. { rek'taŋ·gyə·lər 'chärt }

rectangular coordinates *See* cartesian coordinates. { rek'taŋ·gyə·lər kō'ȯrd·ən·əts }

rectangular cross ripple mark [GEOL] An oscillation cross ripple mark consisting of two sets of ripples which intersect at right angles, enclosing a rectangular pit. { rek'taŋ·gyə·lər ¦krȯs 'rip·əl ,märk }

rectangular distribution *See* uniform distribution. { rek'taŋ·gyə·lər ,dis·trə'byü·shən }

rectangular drainage pattern [GEOL] A drainage pattern characterized by many right-angle bends in both the main streams and their tributaries. Also known as lattice drainage pattern. { rek'taŋ·gyə·lər 'drān·ij ,pad·ərn }

rectangular game *See* matrix game. { rek'taŋ·gyə·lər 'gām }

rectangular hyperbola [MATH] A hyperbola whose major and minor axes are equal. { rek'taŋ·gyə·lər hī'pər·bə·lə }

rectangular mesh [TEXT] Cloth with a different mesh count in the fill than in the warp. Also known as oblong mesh. { rek'taŋ·gyə·lər 'mesh }

rectangular parallelepiped [MATH] A parallelepiped with bases as rectangles all perpendicular to its lateral faces. Also known as rectangular solid. { rek'taŋ·gyə·lər ,par·ə,lel·ə'pī,ped }

rectangular projection [MAP] A cylindrical map projection with uniform spacing of the parallels; used for the star chart in the Air Almanac. { rek'taŋ·gyə·lər prə'jek·shən }

rectangular pulse [ELECTR] A pulse in which the wave amplitude suddenly changes from zero to another value at which it remains constant for a short period of time, and then suddenly changes back to zero. { rek'taŋ·gyə·lər 'pəls }

rectangular scanning [ELECTR] Two-dimensional sector scanning in which a slow sector scanning in one direction is superimposed on a rapid sector scanning in a perpendicular direction. { rek'taŋ·gyə·lər 'skan·iŋ }

rectangular search [NAV] A search of three legs from a moving point, the first and third legs being perpendicular to the base course of the moving point, and the second leg being parallel to it. { rek'taŋ·gyə·lər 'sərch }

rectangular solid *See* rectangular parallelepiped. { rek'taŋ·gyə·lər 'säl·əd }

rectangular wave [ELECTR] A periodic wave that alternately and suddenly changes from one to the other of two fixed values. Also known as rectangular wave train. { rek'taŋ·gyə·lər 'wāv }

rectangular waveguide [ELECTROMAG] A waveguide having a rectangular cross section. { rek'taŋ·gyə·lər 'wāv,gīd }

rectangular wave train *See* rectangular wave. { rek'taŋ·gyə·lər 'wāv ,trān }

rectangular weir [CIV ENG] A weir with a rectangular notch at top for measurement of water flow in open channels; it is simple, easy to make, accurate, and popular. { rek'taŋ·gyə·lər 'wer }

Rectenna [ELECTR] A device that converts microwave energy in direct-current power; consists of a number of small dipoles, each having its own diode rectifier network, which are connected to direct-current buses. { rek'ten·ə }

Recticornia [INV ZOO] A family of amphipod crustaceans in the superfamily Genuina containing forms in which the first antennae are straight, arise from the anterior margin of the head, and have few flagellar segments. { ,rek·tə'kȯr·nē·ə }

rectifiable curve [MATH] A curve whose length can be computed and is finite. { 'rek·tə,fī·ə·bəl 'kərv }

rectification [CIV ENG] A new alignment to correct a deviation of a stream channel or bank. [ELEC] The process of converting an alternating current to a unidirectional current. [GEOL] The simplification and straightening of the outline of an initially irregular and crenulate shoreline through the cutting back of headlands and offshore islands by marine erosion, and through deposition of waste from erosion or of sediment brought down by neighboring rivers. [GRAPHICS] The transformation of a photograph onto a horizontal plane so as to remove or correct displacements (distortions in perspective) by tilt. { ,rek·tə·fə'kā·shən }

rectification distillation [CHEM ENG] A distillation technique in which a rectifying column is used. { ,rek·tə·fə'kā·shən ,dis·tə'lā·shən }

rectification factor [ELECTR] Quotient of the change in average current of an electrode by the change in amplitude of the alternating sinusoidal voltage applied to the same electrode, the direct voltages of this and other electrodes being maintained constant. { ,rek·tə·fə'kā·shən ,fak·tər }

rectified value [ELEC] For an alternating quantity, the average of all the positive (or negative) values of the quantity during an integral number of periods. { 'rek·tə,fīd 'val·yü }

rectifier [ELEC] A nonlinear circuit component that allows more current to flow in one direction than the other; ideally, it allows current to flow in one direction unimpeded but allows no current to flow in the other direction. { 'rek·tə,fī·ər }

rectifier filter [ELECTR] An electric filter used in smoothing out the voltage fluctuation of an electron tube rectifier, and generally placed between the rectifier's output and the load resistance. { 'rek·tə,fī·ər ,fil·tər }

rectifier instrument [ENG] Combination of an instrument sensitive to direct current and a rectifying device whereby alternating current (or voltages) may be rectified for measurement. { 'rek·tə,fī·ər ,in·strə·mənt }

rectifier rating [ELECTR] A performance rating for a semiconductor rectifier, usually on the basis of the root-mean-square value of sinusoidal voltage that it can withstand in the reverse direction and the average current density that it will pass in the forward direction. { 'rek·tə,fī·ər ,rād·iŋ }

rectifier stack [ELECTR] A dry-disk rectifier made up of layers or stacks of disks of individual rectifiers, as in a selenium rectifier or copper-oxide rectifier. { 'rek·tə,fī·ər ,stak }

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